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Digital transformation readiness: perspectives on academia and library outcomes in information literacy

Marek Deja [a,*], Dorota Rak [a], Brigitte Bell [b]

[a] Jagiellonian University, Faculty of Management and Social Communication, Institute of Information Studies, Łojasiewicza 4, 30-348, Kraków, Poland
[b] LaVerne & Dorothy Brown Library, University of St. Francis, 600 Taylor Street, Joliet, IL 60435, United States of America

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ABSTRACT

This study examines the readiness of a faculty for the social challenges caused by the digital transformation in academia with the use of covariance-based structural equation modeling (CBSEM). Based on the survey results, we have examined the interplay between factors related to digital transformation. The concepts of information literacy and digital literacy related to academic librarianship were used as the basis for the self-efficacy and empowerment necessary to achieve individual success during digital changes in the academic community. We then checked how such a sense of empowerment among academics explains the presence of information culture in this community and different approaches to information management. The factors of information management and information use were presented as affecting a university's institutional readiness for the new requirements of digital transformation from the perspective of governance issues. The findings highlight that information literacy underlies academics' empowerment and a high level of self-efficacy driven by this literacy can also be indirectly translated into the formation of pro-active information culture that strengthens an academic's position in creating information use outcomes and by making them ready for digital transformation. Through information literacy outcomes the academic libraries can turn out to be an important transformative force in terms of digital changes at universities.

Introduction

Technological changes are marked by events and situations important to society. Undoubtedly, we are currently facing a technological revolution caused by a pandemic. It has resulted in significant changes in the area of academic work, faced by various universities around the world. This situation inspired us to conduct a study on digital readiness in universities and the role of libraries in these changes. One of the prime changes in the academic community was digital transformation, visible mostly in communication, but also in the rapid emancipation of online information sources or knowledge-sharing in digital ecosystems.

Digital Transformation (DT) can be defined primarily as an organizational change. It is implemented with the use of technology in areas such as operation models, models of cooperation with the external and internal environment, services provided, a technology used, and information management (Mazurek, 2019). As Cheng Gong and Vincent Ribiere have noted, "in early definitions, the concept DT was used, or probably misused, synonymously with traditional definitions of digitization" (Gong & Ribiere, 2021, p. 2). The mere use of digital technologies is insufficient for DT, as factors specific to the individual and society are also important (Henriette et al., 2015). Longmeier and Murphy (2021) showed that academic librarians in particular have emerged during digital transformation "as experts, collaborators, and connectors to services and resources across the university". They provide a broad suite of services and programs related to information and digital literacy, including "scholarly communication, data analysis, digitization services, user experience technology, and innovative teaching and learning resources" all of that as a service based on community building and building a shared culture mostly focused on digital humanities (Longmeier & Murphy, 2021, p. 143). Recently even libraries with a less online presence need to reinvent themselves to enroll an entire program of online services that will move librarianship to a new era of digital transformation. Academic librarians nowadays must therefore reevaluate their priorities for "training and support, and for services that can be delivered remotely in light of both the temporal restriction to access to physical buildings and the future needs that may be created with a second wave of the pandemic, causing further uncertainty" (Martzoukou, 2020, p. 268). This article aims to create a

* Corresponding author.
E-mail addresses: marek.deja@uj.edu.pl (M. Deja), dorota.rak@uj.edu.pl (D. Rak), BBell@stfrancis.edu (B. Bell).

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structural model of digital transformation readiness in academia that is useful for librarians to prepare for effective work and support of the academic community in the field of social sciences and the humanities.

In particular, we emphasize the meaning of information and digital literacy as outcomes of training activities of academic librarians, which gained significance during digital transformation. Digital changes are differently perceived among different institutions. While universities are mostly focused on reporting data that are easy to track, they might miss goals of all key stakeholders in academia, and should be rather looking at those factors that capture the transformative nature of the work, "where ideas are shared, collaborations are forged, and assumptions are challenged" (Longmeier & Murphy, 2021, p. 144).

We used mainly two research methods. The first involved a critical literature review to determine the state of the research and define basic concepts. The second was an online survey conducted using the Microsoft Forms software. The survey respondents were research and teaching staff representing Polish universities and faculties in the field of social sciences and the humanities (according to the OECD classification). The survey made it possible to conceptualize a structural model that shows the relationship between factors such as information literacy (IL) and digital literacy (DL), information culture (IC), information empowerment (IE), information management (IM), information use (IU) and self-efficacy (SE). The goal of our study is to answer two research questions: RQ1 "How do these factors create readiness for digital transformation among the academic community in social sciences and the humanities?" RQ2 "How can academic libraries support digital transformation in the faculty?"

Theoretical background

Digital transformation

Digital transformation encompasses many concepts that have already been well described in systematic literature reviews, for example, Henriette et al., 2015 or Verhoef et al., 2019. Fadwa Zaoui and Nissrine Souissi distinguished several semantic categories of DT processes: assessments (pre-digitalization, digital maturity, post-digitalization), strategic milestones, guidelines and directions for companies, customer experience, operational digital transformation, designing the DT, DT of business processes, converting the strategic directions into objectives, field implementation of DT, DT on level of organization, product and service offers, building the digital culture of the company, clients and context, DT of value creation, adjust or rebuild the business model, ICT integration, building skills, financial support, budget and benefits (Zaoui & Souissi, 2020, pp. 623).

The concept of DT in the literature is very often mentioned alongside digitization and digitalization. They are not identical because they refer to different levels of digital technology use (Gong & Ribiere, 2021). Digitization can be implemented by transforming a physical resource into a digital resource (digitalization) (Henriette et al., 2015). The main component of DT is the need to use modern digital technologies to remain competitive. The idea is to provide online and offline services using digital platforms and the Internet (Mergel et al., 2019).

Nowadays, the relationship between digital literacy and organizational issues during a pandemic would appear to be more relevant. Organizations had to check to what extent their digital maturity was developed. According to Gordon Fletcher and Marie Griffiths "If becoming digitally mature is the goal of an organization's strategic digital transformation process it is not a short-term activity" (Fletcher & Griffiths, 2020, pp. 2). Moreover, less digitally mature organizations are more prone to problems and less responsive to changes. On the other hand, the digital transformation has become so dynamic that enterprises are unable to gradually implement security procedures. They happen too quickly; therefore, network problems accumulate, which affect the security and stability of companies (Meyers, 2020).

Until recently, digital transformation was associated solely with business and its specific areas (Verhoef et al., 2019). What is more, DT was analyzed in the context of business models, operational processes, and user experiences (Henriette et al., 2015). Currently, a paradigm shift can be noticed, and considerations are directed towards multidisciplinary discourse. This is also the interdisciplinary nature of the DT itself. Therefore, the number of publications devoted to digital transformation and social contexts other than business, such as public administration, "especially e-government, e-governance, digital government, and transformational government" (Mergel et al., 2019, pp. 3) or education (including higher education) (Jackson, 2019; Mazurek, 2019; Sousa & Rocha, 2019) is still increasing. As it turns out, although digital transformation is related to social areas, some researchers believe that it is difficult to relate it to social theories. This is due to the digital literacy of social theorists who are dependent on specialists of ICT – their skills are not as developed as specialists in this field (Roth et al., 2019).

An important area of digital transformation that researchers have recently started paying attention to is higher education. Changes at universities regarding digital transformation result from a policy shift at a supranational level. An example of such an approach may be, for example, the strategy for smart, sustainable, and inclusive growth developed by the European Commission for 2020. One of the assumptions of the document is intelligent growth, which assumes the development of an economy based on knowledge and innovation and is therefore related to the digital transformation on the one hand, and education on the other (European Commission, 2010). DT is a particularly extensive issue in terms of the opportunities offered by the using of modern technologies (more as a total solution, not a specific program) (Jackson, 2019) because this process involves a profound transformation of all areas of the organization's operations and its environment, not only the IT infrastructure (Mazurek, 2019). Studies on digital transformation at universities show that there are two levels of this process in academia. One happens at the administrative level. To benefit from digital transformation, universities as organizations should be "equipped" with appropriate information and digital competencies, which are especially useful in the context of augmented reality, artificial intelligence, robotization, digitization, and the Internet of Things (Sousa & Rocha, 2019). Also, being up to date with current DT and higher education models can prevent inefficiencies. Addressing technological disruptions can protect universities for which the institutional dimension is not sufficient, because they also need technological changes Jackson, 2019).

The second level of connections between universities and DT is related to the possibilities of influencing the degree of using new technologies in learning like MOOCs and Open Access platform (Mazurek, 2019), social media, and some "learnings" (eLearning, mobile learning; learning object repository, blended learning), blackboard and video-conferences (Sousa & Rocha, 2019). The essence of learning in the process of digital transformation are: "Collaborative Communities; Cooperative learning; Collaborative learning; Network participation" (Sousa & Rocha, 2019, pp. 329). Online learning is a chance for academic staff to develop their abilities and competencies (Chang, 2016), so it is necessary to investigate how ready academics are for these two levels of digital changes (in terms of their work responsibilities as a community and as individuals).

Academic librarians have become important actors in the context of the DT. They were necessary mainly to support students and employees in facing accessibility barriers (Martzoukou, 2020) and they pay attention to metacognitive aspects and their connection with information skills (Blummer & Kenton, 2014). For many academic libraries, the biggest challenge has been the transfer of comprehensive information services to the online space (Rafiq et al., 2021). Due to the pandemic, academic librarians responded to serious threats to public health too (Guo et al., 2020) and they had to adapt to online education as they are called to work remotely, share resources only electronically, and teach almost exclusively online. As Indrák and Pokorná noted, one of the consequences of this digital transformation in libraries is the fact that

the reach of the library has increased and the distance with the user has decreased - he has access to documents, as long as it is not restricted, for example, by copyright (Indrák & Pokorná, 2020).

Information literacy and digital literacy

The development of social media and various models of cooperation in the information environment meant that now IL is also associated with the need to create and share information in online environments (Mackey & Jacobson, 2011). In a socio-cultural context, IL is linked to the activities of specific groups and communities (Wang et al., 2011). Such a specific environment can be a university where three groups of entities meet: students, academic staff, and librarians, and the perspective of IL is different for these groups. Students are perceived as users of information (staff as trainers in the field of information competencies, and librarians are responsible for the adaptation and implementation of IL standards (Bruce, 1995; Yevelson-Shorsher & Bronstein, 2018). Moreover, the role of librarians is evolving as they are actively involved in curriculum design (Moselen & Wang, 2014). Students face the problem of constructing their knowledge, searching for and processing the information as well integrating the resources they find into the existing knowledge system so that they can carry out real tasks (Brand-Gruwel et al., 2005). There still has not been enough research on scientists tested from the perspective of being information users, in which information competencies are closely related to the needs of the researcher (Rozkosz, 2017), despite that scientists can choose from a variety of rich information opportunities to acquire knowledge, although these are highly complex in terms of sources and formats (Okiki & Mabawonku, 2013). It is therefore clear that academic libraries are facing their new role, to which DT has contributed. It results in even greater development of students' information skills and closer cooperation with academic teachers. The results of these activities are content in didactic courses and research on IL. It is important that social relations between librarians and academic staff are being strengthened (Anuradha, 2018). The undoubted strength of academic libraries is their experience and openness, which enable the implementation of new technologies at an early stage of changes. The role of academic libraries is therefore crucial in the digital transformation readiness of universities (Sandhu, 2018).

The development of Internet technologies has forced changes in the area of information competencies and has also contributed to the evolution of digital competencies. They are often combined into a triad with Information Literacy and Media Literacy. Researchers indicate that information literacy is the main factor that has resulted in the use of ICT (Yu et al., 2017). Digital competencies are often used in a limited context as effective use of information and communication technologies (Koltay, 2011), because "individuals are required to use a growing variety of technical, cognitive, and sociological skills to perform tasks and solve problems in digital environments" (Eshet, 2004, p. 93). Meanwhile, digital competencies include the skills to use, access, filter, evaluate, create, program, and share digital content – in other words, they are "sets of specific skills and competencies needed for finding and handling information in the computerized form" (Bawden, 2008, p. 21). The ability to manage, protect, recognize and use software, devices, AI, or robots is also considered essential (COUNCIL, 2018).

As digital competencies are most often associated with online learning in the context of a university, the main effort will be to define and communicate the problem well (Green et al., 2018). If academic staff know how to define how to use DL for learning, digital competencies become part of their identity (Zimmer et al., 2021). The use of ICT is a factor determining the development of self-efficacy (Kultawanich et al., 2015; Hatlevik et al., 2018), and a high level of information literacy goes hand in hand with a high sense of self-efficacy (Zenita et al., 2015).

Information outcome dimensions in academia

Information management & information use

The status of information management (IM) is not homogeneous, as evidenced by different approaches in the literature. For example, Brian Detlor pointed to four perspectives of IM. First, these are the concepts that define IM in the context of the process. Second, information management is characterized from the point of view of the organization in which information is treated as a resource. Also, it manages information processes such as: creating, acquiring, storing, identifying, copying, and archiving. Moreover, ICT plays a significant role in the organization. Specific goals and organizational strategies force the adoption of specific technologies to make information management run efficiently (Opoku, 2015). In this context, the organizational management of information processes is also mentioned. The third perspective is related to the individual, personal dimension of information management. Finally, the fourth approach is related to libraries and deals with information retrieval, organization, storage, retrieval, access, and dissemination (Detlor, 2010).

It is not without significance that people face obstacles in information management. Theodoros Evgeniou and Phillip Cartwright distinguished three types of obstacles: 1) behavioral, 2) process and 3) organizational (Evgeniou & Cartwright, 2005). These obstacles and the problems involved in information management systems at universities, which can include issues with cybersecurity, changing standards, rules, and principles, as well as doubts in terms of decision-making, make information management a real challenge (Musti, 2020). It also happens that the organization does not reach IT maturity, is not ready to accept the necessary changes (Turner & Stylianou, 2004), and is exposed to various adverse events (Koehler et al., 2015).

As managing library information collections is a challenging process in itself, the extensive digitization of information resources has placed new pressures on librarians to respond to new skills and user competencies to effectively share digital library collections – e.g. metaliteracy – to provide support for the scholarly activity (Deja & Rak, 2019). "In order to manage the transition and reliance on digital information collections, it is important more than ever for libraries to consider the expectations and needs of end-users, as well as limitations in library staff and budget adaptability. These are critical factors in rolling out any successful information management program from a library perspective" (Detlor, 2010, p. 107).

Universities as learning organizations have vast amounts of information that they can use for a variety of purposes. The studies conducted so far indicate that institutions can be treated as information processing systems, decision-making systems, and interpretive systems (Choo, 2002). Universities become intelligent organizations (environments) where structures are shaped by creating meta-information, organizing data, and its flow and use. An intelligent organization is a system in which, on the one hand, knowledge is possessed and, on the other hand, is created. What is more, IM "is the harnessing of the information resources and information capabilities of the organization to add and create value both for itself and for its clients or customers" (Agu, 2017, p. 124). It is not without significance that information management at universities is currently referred to in the context of the use of information systems (Adam et al., 2020), analytical data management (Potthoff et al., 2019), Big Data (Wixom et al., 2014), and copyright information management (in university libraries) (Albitz, 2013). Visibly, information management in the context of academia can be "divided" into aspects related to the administrative activity (management by HEIs) of the university and the activity of researchers (employment, teaching, learning, conducting research) (Renfrew et al., 2010).

An important point is that – as emphasized by Adrienne Curry and Caroline Moore – "all employees are able to access that information which is necessary for the successful execution of their daily tasks" (Curry & Moore, 2003, p. 98). Through information management people

in an organization might be forced to engage in different information behavior, starting with defining the information need and ending with the information use (IU). IU may be interpreted as a process from the moment the information is obtained to the operational purpose (Choo, 2002; Popovič et al., 2014). It can be divided into three levels: the task, in which information is instrumental and consists in defining the problem; self-efficacy, in which self-motivation and the perspective of self-realization are a key element; social maintenance, in which the use of information is intended to develop social relations (Choo et al., 2006).

Information culture & empowerment

Information culture is described "as the socially shared patterns of behaviors, norms, and values that define the significance and use of information in an organization" (Choo, 2013, p. 775) and emphasizes the importance of the relationship that exists between a specific system (environment) and information. Information culture, therefore, consists of attributes characteristic of information management: information values and standards, information behavior resulting from information needs, information seeking, and information use (Choo, 2013). As Chun Wei Choo et al. (2006) emphasizes, information behavior can be both individual and collective (team) in an organization. Each organization has a distinctly developed culture in which there is a clearly defined approach to information. From a different perspective, the information culture can be seen as one in which information plays a role that determines strategic success. It is the IC that affects the operational efficiency of the organization (Sundqvist & Svärd, 2016).

Information culture "stimulates the combination of knowledge" (Vick et al., 2015, p. 297) and it can also influence knowledge management and academic empowerment (Deja & Wójcik, 2021). Information culture can be inherited and perpetuated (Bielby & Kelly, 2016). Librarians' roles in academia can be seen as a part of a process of maintaining information culture through their commitment to developing information competencies.

Information culture is related to so-called structural academic strengthening, understood as appropriate conditions and resources conducive to the didactic process, and therefore knowledge sharing (Tumino et al., 2020). The university administration provides these conditions and resources to serve the academic community. On the one hand, scientists act as organizers and "donors." In this approach, the information behavior (Huvila & Ahmad, 2018), competencies (self-efficacy), and motivation (Dağgöl, 2020) of academics play a particularly important role.

Information empowerment is connected to critical thinking about people's environments (Perkins & Zimmerman, 1995), so along with the awareness of the existence of social norms (like information culture), it will shape employees' readiness for changes (Maiorano et al., 2020). Employee empowerment influences the operation of the entire university system (Buhl, 1982). Research shows that academic librarians can also play an important role in this area, and by engaging their interests, they contribute to the development of innovation (Deja & Wójcik, 2021). On the other hand, academic teachers become beneficiaries – the university as an organization can help them solve problems, develop skills, and implement a motivational system to minimize the risk of stressful situations arising. Such activities aim to evoke a sense of satisfaction in the employee, which is associated with running the full potential of staff. The very process of building employee empowerment is lengthy and slow, but necessary (Ongori, 2009).

We hypothesized that academic librarians, through their contribution to information literacy, can influence the self-efficiency and empowerment of academic staff. This empowerment influences how the academic staff receives information culture, and how they find themselves within their use of information, in both behavioral and organizational terms. This gives libraries a special position in university information management, where on the one hand they shape the competencies of the users and, on the other hand, influence the methods of information management in the area of scientific information – which describes the output of academics.

Information self-efficacy

The possession of specific competencies (information and digital) regulated by the developed models and standards is one of the most important aspects in the context of higher education. An equally important issue is self-efficacy, which can be applied to both university students (Ross et al., 2013, 2016; Hatlevik et al., 2018; Hammer et al., 2020) and staff (Dilekli & Tezci, 2020; Datu & Mateo, 2020; Yin et al., 2020). Self-efficacy, defined as an individuals' belief regarding their influence on actions, tasks, and goals in an organization (Bandura, 1997), is an important factor in the context of digital transformation in higher education (i.e. development of academic self-efficacy). This is particularly evident in the current context, also whenever the need for online learning (Prior et al., 2016) and higher education programs increases (Fletcher, 2005; Martin, 2005; Noben et al., 2021). Self-efficacy is strengthened by social support, i.e. with academic peer group (Zander et al., 2018) or family (Hammer et al., 2020) – which is reflected in online interactions, the feeling that one is acting effectively on the Internet (Zheng et al., 2020). From an academic point of view, self-efficacy can also be defined as "a powerful motivational construct that is associated with a range of desired educational outcomes, including improved academic performance and reduced anxiety" (Huang et al., 2020, p. 12), and a means of dealing with procrastination (Kandemir, 2014) or smartphone addiction (universities play a buffering role in mitigating their effects) (Li et al., 2020). Self-efficacy is also an "important learning outcome because it plays a key role in motivating students to improve their competencies and future actions" (Duchatelet et al., 2021, p. 6). Academic self-efficacy, as a part of self-beliefs, may be one of the factors that influence the use of information skills (Folk, 2016). It is particularly interesting how in the case of academic staff, their self-assessment of information and digital literacy influences their self-efficacy in this time of change, and how librarians through information literacy courses can empower academics during digital transformation.

Many universities employ academic technologists, whose sole designated function is to help faculty develop digital literacy competencies in support of their online teaching and learning. More and more frequently, we see the role of academic technologists intersecting with the role of librarians. In some cases, we see these roles intersect within the same department, position, or job description. There is and has been for quite some time, increasing ambiguity and flexibility regarding the nature of librarians' supportive role in academia. We see these trends moving ever further towards what experts in the field describe as "blended" (Bell & Shank, 2004). This dual role uniquely positions librarians to advance digital initiatives in the curriculum. Under normal circumstances, faculty are sometimes hesitant to embrace these types of initiatives, particularly when it concerns a course within their discipline, which they have taught many times before, in a very specific modality. The pandemic and its accompanying digital transformation in many ways have made these hesitancies irrelevant; motivating faculty to embrace online learning once face-to-face traditional classroom instruction became impossible.

The impact of the pandemic on faculty's approach to teaching and learning has been profound. The pandemic required faculty to abruptly change their instructional modalities and to utilize tools, interfaces, and resources with which they may or may not have been familiar (Day et al., 2021). It also created distance (both literal and metaphorical) between faculty and those invaluable peer support structures inherent to academia. Despite this, throughout the pandemic librarians and academic technologists have stepped in as guides navigating faculty through the difficult transition to teaching online. This support manifests both in digital literacy and demonstration of practical technological skills (how to utilize a course learning management system or host a class meeting over Zoom, for example) as well as information literacy

and the critically evaluative process. For example, can I record a Zoom meeting with my students without their explicit consent? Can I utilize this open educational resource as an alternative to a physical textbook without infringing copyright? Librarians have guided faculty through this digital transformation so they can move forward-facing new challenges with confidence, resulting in information empowerment.

The relationship between the academic staff and self-efficacy is established on two levels. First, it results from the role played by teachers' relations with students (educating, supporting, developing competencies). The second level – relevant to us – relates directly to the self-efficacy displayed by teachers (Yin et al., 2020). Variation in academic staff's level of self-efficacy may result from organizational factors (different curricula at different universities, management style at the institution) (Dilekli & Tezci, 2020; Ilyas et al., 2020) or individual conditions (age, origin, susceptibility to stress and science area) (Soland, 2019; Jokisch et al., 2020; Datu & Mateo, 2020; Li et al., 2020; Burns et al., 2020). What is more, the higher the level of intrinsic motivation to discover things related to current changes, the greater the self-efficacy (Ross et al., 2016).

Hypotheses development

The concept of IL is understood as "the ability to locate, identify, retrieve, evaluate, process, and use digital information optimally" (Techataweewan & Prasertsin, 2018) was used in our study as a set of measures of critical thinking regarding the use of digital sources on technical, cognitive and ethical levels (F. Ahmad et al., 2020; Techataweewan & Prasertsin, 2018). It is linked to the concept of DL as a positive relationship between soft and hard competencies (Hall et al., 2013; Murray & Pérez, 2014). The use of digital technology does not necessarily boost someone's ability to critically assess the quality of information and think critically regarding information sources (Guess et al., 2019). It is hard to expect that librarians will suddenly change to the IT specialists educating computer competencies, such as in the field of data processing, but they can act as curators or trainers, like in the field of data curation or data literacy, but in the field of a digital culture where their primary role is to teach how to work efficiently in the field of information resources and scholarly communication platforms. On the other hand (H1a), the combination of information and digital literacy influences the intention to use digital technology for learning (H1c, H2b) and in general information literacy positively influences the intention to use digital tools (H1a) (Nikou et al., 2020).

In both cases of these key competencies, one's skills may be either overestimated or underestimated during self-assessment (Mahmood, 2016). Therefore, we should not measure the self-assessment per se, but quantify to what extent the self-evaluation of information and DL skills can influence other aspects of one's personal and work-related life, e.g. the SE in the workplace (H1b, H2a). Moreover, IL and DL are also widely studied regarding their influences on SE in terms of the functioning of different groups of information users like CEOs, academics, and students (Ahmad et al., 2020; de Meulemeester et al., 2018).

Kurbanoglu et al. (2006) proved that information literacy skills regarding the use of a variety of library information sources – printed and electronic – and the ability to locate resources using library catalog as a basic IL skill have a significant influence on user performance in digital resource use and self-efficacy (H1b) (Kurbanoglu et al., 2006). Academic librarians might then support the DT from the perspective of individual self-efficacy on the daily basis by shaping digital and information literacy among faculty. The self-efficacy of information users during the DT in academia might be a key factor in empowering employees – in our case academic staff – and give them a persistent belief that they are striving to achieve their goals effectively (Mahmood, 2016) even in difficult times such as a pandemic (H1c, H2b) (Pan et al., 2020). Kurbanoglu et al. (2006, p. 731) state that "self-efficacy provides the foundation for human motivation, wellbeing, and personal accomplishment" which are key factors of work-related empowerment (H3) (Spreitzer, 2007).

Self-efficacy, defined as an individuals' belief regarding their influence on actions, tasks, and goals in an organization (Bandura, 1997), is an important factor in the context of digital transformation in higher education (i.e. development of academic self-efficacy). This is particularly evident in the current context, also whenever the need for online learning (Fletcher, 2005; Prior et al., 2016) and IL in higher education programs increases (Fletcher, 2005; Martin, 2005; Noben et al., 2021). Self-efficacy is strengthened by social support, i.e. with academic peer groups (Zander et al., 2018). From an academic point of view, SE can also be defined as "a powerful motivational construct that is associated with a range of desired educational outcomes, including improved academic performance and reduced anxiety" (H3) (Huang et al., 2020, p. 12). Self-efficacy is also an "important learning outcome because it plays a key role in motivating scholars to improve their competencies and future actions" (Duchatelet et al., 2021, p. 6). It is particularly interesting how in the case of academic staff, their self-assessment of information (H1b) and digital literacy (H2b) influences their self-efficacy in this time of digital change, and how librarians through information literacy courses can empower academics during digital transformation.

Information empowerment is based on learning from information experience, which allows people to develop "new, more complex ways of conceiving of, or experiencing information and information use" (H3) (Bruce et al., 2014; Somerville & Bruce, 2017, p. 2). As an addition to such information-based self-development, Ahmad et al. (2020) added a set of information environment' awareness measures that empower employees in decision making and efficacy by increasing the constant need to "use of formal information objects, such as written and verbal reports, manuals, and company documents, but also on informal information, for instance, opinions, ideas, and considerations available within the organization's internal social network". Based on the literature review and above arguments we posit first initial six research hypothesis regarding academics' individual readiness for DT:

Hypothesis 1a. Information literacy has a statistically significant positive effect on Digital literacy during the digital transformation in academia.

Hypothesis 1b. Information literacy has a statistically significant positive effect on Information Self-efficacy during the digital transformation in academia.

Hypothesis 1c. Information empowerment has a statistically significant positive effect on Information empowerment during the digital transformation in academia.

Hypothesis 2a. Digital literacy has a statistically significant positive effect on Information culture during the digital transformation in academia.

Hypothesis 2b. Digital literacy has a statistically significant positive effect on Information empowerment during the digital transformation in academia.

Hypothesis 3. Self-efficacy has a statistically significant positive effect on Information empowerment during the digital transformation in academia.

The second part of our model is more of a system-based approach to digital transformation readiness. DT readiness is not just a set of individual cognitive attitudes and settings regarding the digital environment or resources. It is also based on group interactions and collaborative information behaviors shaping information culture in digital channels of communications that might influence effective information management and information used during the rapid digital transformation changes at university or college (H5a, H5b) (Agolla, 2018; Caiado et al., 2021). With informatively and digitally empowered academic staff, information culture can be considered as congruent with the information system of a studied organization (H4) (Choo, 2013). Hence, we expand

our model to a more holistic view where librarians as embedded librarians or information specialists are involved in academic work and can play an important role in the DT at the faculty. However, to do so efficiently they must recognize the current situation in their institution related to the forms of information use in academic information culture (H7a, H7b) (Deja & Wójcik, 2021).

Previous studies on information culture show that awareness of the information environment in terms of the recognition of different forms of knowledge sharing (Collins, 2010) and procedures and norms regarding the formal organization of information e.g. in university's record management (Oliver, 2004, 2007, 2008) might have an impact on shaping the information culture of a given institution. A study by Vick et al. (2015) and Lauri et al. (2016) in particular shows that what makes the academic community truly effective and empowers it to collectively develop new ideas and to manifest pro-innovative information behavior is the general awareness of formal procedures and the information needs of their colleagues and superiors (H4). The academic staff in a more recent study by Lauri et al. (2020) point out that the main reason for information overload was the general work-related overload and diversity of tasks. This issue can be managed by "addressing the framework for the development of information literacy at the institutional level", which "could reduce the lack of time as one of the main barriers to effective information use" and also by "cooperation and learning from each other" to find a formal framework in the topics most important for the HEI (Lauri et al., 2020, p. 22). As information and digital literacy might empower academic staff, the level of this information-based empowerment might then explain different forms of group information behavior in the information culture dimension of digital transformation (H4).

As discussed, academic librarians play a key role in promoting both digital and information literacy competencies through their interactions with faculty. According to Franklin (2013), this collaboration between faculty and librarians is key to implementing a pervasive information culture and making it sustainable. This culture certainly can and does exist within the scholarly communications sphere, but it also extends beyond the classroom. In a way, we must view the information culture of a campus holistically, as none of these factors are mutually exclusive. Librarians facilitate information empowerment in faculty, which in turn leads them to foster the same sense of empowerment in their students. As a result, students will learn - if not the exact same DL and IL competencies, practically speaking – but the same universal acceptance of their importance. As outlined by Sandhu (2018), a strong commitment to information culture agreed upon among various constituent groups (librarians, faculty, students) is essential to the survival of academia in the midst of significant digital transformation.

The information culture of an institution has a direct positive impact on information use (H5a) (Abrahamson & Goodman-Delahunty, 2013; Choo et al., 2008) and information management (H5b, H6) (Choo et al., 2006). Virkus and Salman (2020) showed that departments might have multiple information culture profiles with mixed attributes from relationship-based culture and risk-taking culture which facilitate different approaches to information use and knowledge sharing. Creating a positive and collegial work atmosphere, open communication, and also good communication about the direction that the department is taking are the main factors that facilitate good leadership in higher education regarding information management and use – especially in case of the focus on the use of external sources of information, and the increase of information and knowledge sharing (Virkus & Salman, 2020). Based on the above considerations, we posit an additional six research hypothesis regarding organizational readiness for DT:

Hypothesis 4. Information empowerment has a statistically significant positive effect on Information culture during the digital transformation in academia.

Hypothesis 5a. Information culture has a statistically significant positive effect on Information use during the digital transformation in academia.

Hypothesis 5b. Information culture has a statistically significant positive effect on Information management during the digital transformation in academia.

Hypothesis 6. Information management has a statistically significant positive effect on Information use during the digital transformation in academia.

Hypothesis 7a. Information culture mediates the relationship between Information empowerment and Information management during the digital transformation in academia.

Hypothesis 7b. Information culture mediates the relationship between Information empowerment and Information use during the digital transformation in academia.

Our conceptual framework of digital transformation (Fig. 1) derives concepts from the literature review and constitutes seven pillars of effective digital transformation in academia. Our model is complementary to other digital transformation models like, for example, the González-Varon et al. (2021) model of Organizational Competence for Digital Transformation but with a clear focus on library and information science (an ontic analogy that might be useful for embedded librarians). According to González-Varon et al. (2021) what builds organizational competence for digital transformation is organization knowledge set upon five foundation stones 1) governance (analogous to information management and information use); 2) organizational alignment (analogous to information empowerment); 3) organizational culture (analogous to information culture); 4) technological characteristics (analogous to information literacy and digital literacy) and 5) employees (analogous to self-efficacy). These capabilities reassure the readiness of employees (in our case, academic staff) for the challenges of digital transformation by making employees self-aware of their competencies thereby giving them levers of growth in the digital information environment (Holzhauser & Schalla, 2017).

Methodology

The data for this research was collected by surveying academic staff from highly ranked universities in Poland in terms of their local contribution to social sciences and the humanities. The target population was identified through the "POL-on" public database and the "Perspektywy" local higher education ranking. The sample of this study was limited to 266 respondents from 6 higher education institutions. The data was collected via an online questionnaire. An invitation letter containing a link to the survey was distributed via e-mail from September to November 2020.

This study uses a non-probability sampling – a purposive sampling procedure. The non-probability samples yielded results that are as good as, or even better than, probability-based samples (Twyman, 2008; Vavreck & Rivers, 2008). In this study, the respondents were academic staff employed in research-teaching positions in higher education institutions. The demographic information of the respondents is shown in Table 1.

The data analysis was conducted with SPSS 26 and AMOS 26. SPSS was mainly used for descriptive analyses and extracting factors in exploratory factor analysis (EFA) while the AMOS software was used to perform a CBSEM analysis, and to validate the measurements and structural model in confirmatory factor analysis (CFA). We used the CBSEM procedure instead of PLS-SEM because it is a "common factor-based SEM (i.e., covariance-based SEM; CBSEM), which considers the constructs as common factors that explain the covariation between their associated indicators" (Sarstedt et al., 2016). The CBSEM procedure is more appropriate to measure the effect of indicators in reflective conceptualization – like, in our case, regarding factors explaining digital

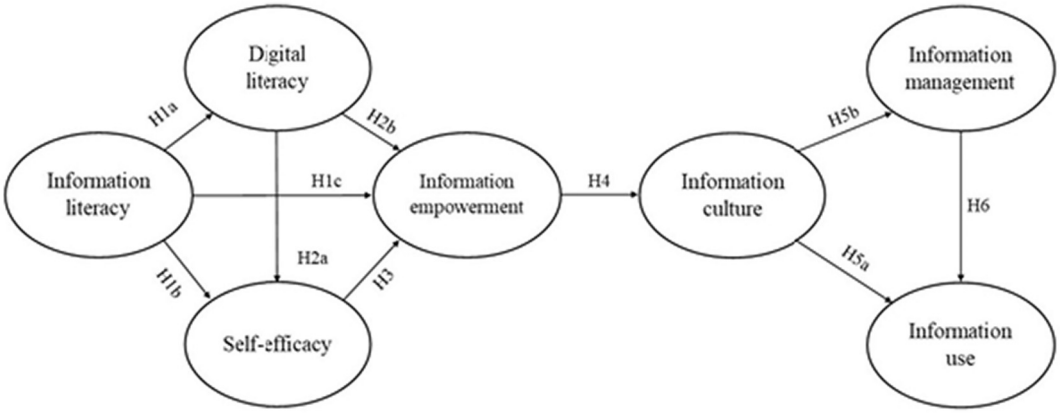

Fig. 1. Conceptual framework.

Table 1
Respondents' demographics ($N = 266$).

	N	%
Gender		
Female	140	53%
Male	115	43%
I'd rather not say	11	4%
Age		
18–24	1	0.4%
25–34	43	16.2%
35–44	84	31.6%
45–54	73	27.4%
55–64	49	18.4%
65+	16	6%
Academic and work-related degree		
Master's Diploma	32	12.1%
PhD	129	48.5%
PhD with Engineer's degree	6	2.3%
Assistant Professor	23	8.6%
Associate Professor	53	19.9%
Professor	23	8.6%
The OECD Frascati classification of science and technology (FOS) – Respondents fields of science		
Social Sciences	159	59%
Humanities	107	41%
Years of employment in the academia and science sector		
<5	23	8.6%
<10	56	21.1%
<20	86	32.3%
<30	56	21.1%
<40	34	12.8%
>40	11	4.1%

transformation readiness indicators – while the PLS procedure is more appropriate for formative conceptualization while measuring composite indicators.

Measures

This study applied scales from the literature review. All items were measured using five-point Likert scales bookended by one (strongly disagree) and five (strongly agree). Information management and Information use dimensions were measured with seven items and six items respectively that were adapted from Abrahamson and Goodman-Delahunty (2013), originally was created by Choo et al. (2008, 2006). Information culture was measured through a twelve-item scale adapted from Vick et al. (2015) interpretation of Choo's 4R model (Choo, 2013) which was more appropriate for use in the academic environment than Choo et al.'s (2008, 2006) earlier model as Vick et al. devised a set of items related to knowledge creation in academic projects. We also adapted an eight-item measure self-evaluation scale of Information empowerment from two scales of "Awareness of information environment" and "Learning from information experience" developed by Ahmad et al. (2020). Respectively, nine items of the Data literacy self-assessment scale and eight items measuring SE were taken from Nikou et al. (2020). Seven Information literacy items measuring self-assessment of information competencies were selected from Brand-Gruwel et al. (2005), Kurbanoglu et al. (2006), and Nikou et al. (2020). The last dimension of measurements is also focused on library digital services, which are our model's exogenous factor (understood as the main contribution of the library to the education of the academic community – library services outcome). Through the proper educational work of academic librarians, it will influence individual readiness for digital transformation. The remaining six endogenous factors (representing partial results of the IL in academia as an input – DL and SE – output – IE and IC – and outcomes – IM and IU) in our model constitute the relationship structure that builds upon the overall capabilities for digital change in the faculty.

Common method bias

The study used both ex-ante and ex-post approaches to check for common method bias (CBM) (Podsakoff et al., 2003). Common method variance can influence the results of online surveys (Klarner et al., 2013). Firstly, based on Podsakoff et al. (2003), Harman's single-factor was used test to check for CMB. The first factor, extracted using principal axis factoring without rotation, accounted for 27% of the overall variance. No single factor explaining most of the variance and common method variance should influence the survey results (Klarner et al., 2013). Secondly, the latent factor test was used (Podsakoff et al., 2003). The results showed no loss in the significance of the factor loading when the latent factor was introduced to our model. The CMB test results indicated that the level of CMB was minimal in this study.

Overall model evaluation

A confirmatory factor analysis (CFA) with a maximum likelihood (ML) estimation were performed using AMOS 26 to check the fit of the

Table 2
Indices fitness (measurement model of dependent variables).

Indices	Appropriate range	Actual Value	Fit judgment
CMIN/DF	<2	1.648	Yes
RMSE	<0.08	0.049	Yes
RMR	<0.10	0.065	Yes
GFI	>0.80	0.888	Yes
AGFI	>0.80	0.860	Yes
PGFI	>0.50	0.708	Yes
CFI	>0.90	0.953	Yes

measurement model and its reliability and validity (Table 2). The measurement model showed a good fit with the data: CMIN = 426.754 (df = 259; $p < 0.001$); CMIN/df = 1.648; CFI = 0.953; TLI = 0.945; IFI = 0.953; RMSEA = 0.049, PCLOSE = 0.534; RMR = 0.065). The CMIN/DF ratio was below 2.0 (Bagozzi & Yi, 1988; Hair et al., 2010). The IFI, TLI, and CFI exceeded the recommended minimum threshold of 0.90 (Kline, 2005). The RMSEA of 0.048 did not exceed the cutoff of 0.08 (Kline, 2005) nor did the standardized RMR of 0.065 exceed its cutoff of 0.10 (Kline, 2005). The Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) met the evaluation criteria (Kelley & Lai, 2011; Lai & Green, 2016). The absolute fit measures, Goodness-of-Fit Index (GFI) and Adjusted Goodness-of-Fit Index (AGFI) are higher than 0.80, the minimum recommended for good model fit (Bentler & Bonett, 1980).

Measurement model

Table 3 shows that Cronbach's α and composite reliabilities (CR) for the full sample were greater than 0.70. The measurement model has a high level of reliability based on the measured Cronbach's α, CR, and AVE values which surpass the recommended evaluation criteria. The table also shows that all the item loadings were greater than 0.60. It could be concluded that the measurement model has good convergent validity (Ahmad et al., 2016; Fornell & Larcker, 1981).

Discriminant validity was tested using the Fornell and Larcker (1981) criterion and cross-loading evaluation. The square root of AVE for each dimension of digital transformation was greater than the correlations between the constructs, so we can conclude that the measurement model can be considered sufficient regarding its discriminant validity (Gefen et al., 2011; Gefen & Straub, 2005). The cross-loading analysis in Table 5 shows that all indicators load on their respective constructs much higher than their cross-loadings on other constructs.

The sample adequacy based on the KMO test should be considered as highly meritorious or "marvelous" at 0.906 and $p < 0.001$ (Kaiser, 1974, p. 35) (Table 4), which means a representative dataset describing the level of academic staff's readiness for the challenges of digital transformation in higher education institutions in the humanities and social sciences.

Findings

The findings supported our overall model. The study confirmed six out of seven hypotheses in our study. One hypothesis was not supported – H6 – which explored the direct impact of Information management on Information use. The information literacy variable with the indirect support of digital literacy and self-efficacy measures explained 29% of the variance in information empowerment, but individually it explains only 13% in the variance of digital literacy and 19% in self-efficacy. This means it is highly possible that through higher information and digital literacy academics will easier and faster identity what digital sources will be helpful for them while using the information in the future, and they will preferably try to find out how it can be used in new ways or to revise their thinking about job issues faster (Appendix A).

Information empowerment, which is based on the learning from information experience, can explain over 24% of the variance in the information culture of academic staff. Our results show that the most important types of information behaviors are pro-active and internally oriented, meaning that ¼ of behaviors focused on collaborative information searching and use presented by faculty in the IC dimension will depend on their previous experience with open resources and a habit of

Table 3
Measurement statistics of first-order constructs.

Dimension	Code	Mean	SD	Indicator loading	Composite reliability	AVE	Cronbach's alpha
Information culture	IC	3.32	0.94		0.900	0.504	0.914
Item 1	ic_7	3.35	1.31	0.916			
Item 2	ic_9	3.19	1.27	0.859			
Item 3	ic_5	3.45	1.24	0.762			
Item 4	ic_6	2.97	1.23	0.740			
Item 5	ic_11	3.77	1.34	0.729			
Item 6	ic_1	3.21	1.32	0.666			
Item 7	ic_2	3.45	1.24	0.655			
Item 8	ic_10	3.33	1.26	0.646			
Item 9	ic_3	2.55	1.24	0.607			
Information literacy	IL	4.39	0.74		0.843	0.643	0.852
Item 1	il_5	4.45	0.80	0.884			
Item 2	il_6	4.44	0.84	0.820			
Item 3	il_4	4.30	0.82	0.805			
Digital literacy	DL	3.96	0.82		0.850	0.586	0.852
Item 1	dl_6	3.55	1.07	0.910			
Item 2	dl_1	3.87	1.08	0.829			
Item 3	dl_3	4.26	0.89	0.767			
Item 4	dl_2	4.16	0.90	0.729			
Self-efficacy	SE	3.78	0.96		0.864	0.615	0.873
Item 1	se_3	3.69	1.11	0.766			
Item 2	se_5	3.84	1.04	0.757			
Item 3	se_1	3.80	1.12	0.735			
Item 4	se_2	3.80	1.13	0.733			
Information empowerment	IE	3.27	1.05		0.904	0.702	0.908
Item 1	ie_5	3.06	1.21	0.892			
Item 2	ie_8	2.99	1.24	0.853			
Item 3	ie_6	3.59	1.21	0.787			
Item 4	ie_7	3.44	1.10	0.730			
Information management	IM	3.15	1.06		0.885	0.660	0.885
Item 1	im_6	3.18	1.17	0.812			
Item 2	im_3	3.15	1.11	0.782			
Item 3	im_4	3.11	1.32	0.705			
Item 4	im_1	3.00	1.22	0.650			
Information use	IU	3.37	1.12		0.713	0.554	0.715
Item 1	iu_5	3.47	1.27	0.963			
Item 2	iu_7	3.37	1.28	0.883			

Table 5
Intercorrelations of the latent variables for the first-order constructs.

	Information culture	Information literacy	Digital literacy	Self-efficacy	Information empowerment	Information management	Information use
Information culture	**0.710**						
Information literacy	0.264***	**0.802**					
Digital literacy	0.216**	0.355***	**0.765**				
Self-efficacy	0.157*	0.356***	0.450***	**0.784**			
Information empowerment	0.467***	0.431***	0.373***	0.441***	**0.838**		
Information management	0.665***	0.275***	0.173*	0.164*	0.514***	**0.811**	
Information use	0.513***	0.194*	0.521***	0.541***	0.522***	0.367***	**0.745**

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 4
Kaiser-Meyer-Olkin and Bartlett's test.

Kaiser-Meyer-Olkin measure of sampling adequacy		0.906
Bartlett's test of sphericity	Approx. chi-square	9534.409
	df	1596
	Sig.	0.000

think collectively about work issues even after hours.

Three out of four types of IC from Choo's (2013) 4R model remained in our study as relevant to the readiness for digital transformation. (1) The rule-following culture (ic_7 = 3.35; ic_11 = 3.77) where the purpose of information management is to strengthen internal norms and regulations, institutional control, and emphasis on internal information resources such as digital collections of documents, online notebooks, or online publication databases to which licenses are provided via online library services. (2) The relationship-based culture (ic_9 = 3.19; ic_5 = 3.45) where a goal is to strengthen communication and interactions by openly sharing information in less controlled informal information flows, e.g. digital communication channels are used to organize department/faculty-level discussion regarding any new information about organizational changes related to teaching and research, or on a group level discussions about new research topics found in library electronic resources like scientific databases. (3) The risk-taking culture (ic_2 = 3.45; ic_10 = 3.33) supports academics to creatively look for new areas of research and innovations, as focusing on external information that can bring new value. The second and third types of culture described are the reason why sharing information and proactivity of academics are important measures of readies for digital changes, as they enhance the flexibility and creativity of employees, which are balanced by the control of employees performance in faculty in rule-following culture. Such attitudes may explain the high rates of the influence of information culture on the use of information in a faculty. The pro-active and integrated information culture of academic staff explains a great deal of the variance in information management (27%) and even greater regarding information use (45%) making it more possible for academics to step out and have an impact on digital changes at university.

The above findings should be especially interesting for academic librarians that have plans in developing programs that support teaching and research staff in working in digital environments. Looking at an active learning strategy of sharing described by Leslin Charles (2021) one of the challenges in implementing and achieving outcomes in information literacy programs is to include partners in academia, established cooperation, and convince new ones to cooperate. Developing IL-DL programs for students and researchers should be a part of engagement strategies developed by librarians who want to foster interdisciplinary connections and teach researchers new digital skills. Knowing your outcomes in the cultural environment is then crucial to spread an image of the library as an asset for developing teaching and research programs (Longmeier & Murphy, 2021).

One very strong correlation should be pointed out between the information culture dimension and information management in academia, showing and confirming observations taken previously by Choo et al. (2006) that information culture, especially regarding collective information behaviors in seeking and use (ic_5, ic_6, ic_7, ic_9) are driven by continuous learning (IC-IE 0.467) and are an important part of the university's strategy to develop and enhance its human intellectual capital (IC-IM 0.665).

For academic librarians, this knowledge might be useful regarding their activity in developing information literacy courses and to justify their importance while cooperating with the faculty, as these competencies are strongly related to empowerment dimensions in digital transformation (0.467). As our structural model shows, the related IL and DL dimensions (0.355) have a great impact on self-efficacy, and together explain an important part of the variance in information empowerment of academics. These dimensions constitute the main pillars of individual readiness for DT challenges. Collaboration between faculty and librarians is key to implementing a pervasive information culture and making it sustainable for digital changes (Franklin, 2013) As library services in digital forms are increasingly offered, assessment methods are needed for outcomes in emerging new areas of user needs. Through our diagnosis, we can confirm Longmeier & Murphy's (2021) statement that IL-DL programs allow librarians to be more relationship-based support of digital services and its impact to have been captured by us.

Structural model

Our findings revealed the relative importance of several factors of digital transformation readiness (Table 6). Specifically, among the three self-assess competency dimensions (IL, DL, SE) that have a direct impact on information empowerment, as well as between information empowerment and information culture that both have, respectively, an indirect and direct impact on information management and information use in the academic environment. The path coefficients of information literacy on digital literacy ($\beta = 0.353$), self-efficacy ($\beta = 0.346$), and information empowerment ($\beta = 0.362$) are significant at $p < 0.001$, indicating that IL has a statistically important role in these digital transformation readiness factors. The path coefficients of digital literacy on the self-efficacy ($\beta = 0.320$, $p < 0.001$) of academic staff and their information empowerment ($\beta = 0.185$, $p < 0.05$) are also statistically significant, but in the case of DL → IE this impact is much weaker, which indicates that IL or SE ($\beta = 0.311$, $p < 0.001$) individually have a much greater impact on the empowerment of academics than DL (Fig. 2).

Table 6
SEM path analysis.

Hypothesis	Path	Path coefficient estimate	Standard error	t-Value	*p*-Value	Supported or not
H1a	IL → DL	0.353	0.073	4.858	***	Supported
H1b	IL → SE	0.346	0.092	3.777	***	Supported
H1c	IL → IE	0.362	0.096	3.784	***	Supported
H2a	DL → SE	0.320	0.092	3.461	***	Supported
H2b	DL → IE	0.185	0.094	1.971	0.049*	Supported
H3	SE → IE	0.311	0.079	3.930	***	Supported
H4	IE → IC	0.566	0.078	7.248	***	Supported
H5a	IC → IU	0.410	0.067	6.132	***	Supported
H5b	IC → IM	0.672	0.080	8.426	***	Supported
H6	IM → IU	0.031	0.084	0.371	0.711	Not supported
H7a	IE → IC → IM	0.297	0.060	5.514	***	Supported
H7b	IE → IC → IU	0.210	0.052	4.707	***	Supported

* $p < 0.05$.

*** $p < 0.001$.

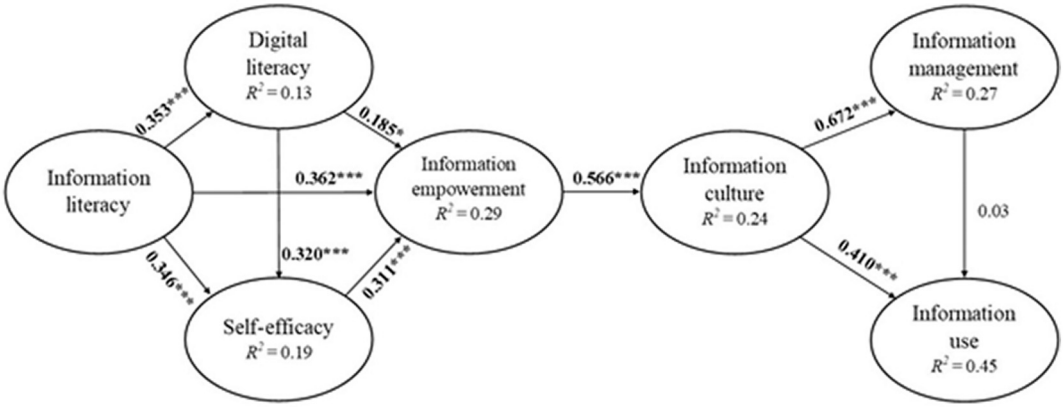

Fig. 2. Structural model of digital transformation readiness in academia.

Recently The USF Libraries Research and Publishing Committee created an "initiative to increase research productivity, advance scholarly output, and establish a culture of research and scholarship among both new and established librarians". Such actions were generally supported by faculty (Schmidt et al., 2021). Integration of librarianship and academic culture is an ongoing process and gains importance in digital transformation. A higher level of IL skills might be a key to success in such a process, and as we showed above, even more than DL skills. Librarians not only facilitate information empowerment in faculty but also are becoming empowering personas, whose main role is to foster the same sense of empowerment in the faculty and among students. A stronger commitment to information culture using information literacy skills is essential to showcase the strong sites of librarians in academia during digital transformation (Sandhu, 2018).

The path coefficient of information empowerment on information culture is the second-highest measured at $\beta = 0.566$ ($p < 0.001$). The strongest impact was observed on the path coefficient of information culture on information management ($\beta = 0.672, p < 0.001$). Information culture also has a significant impact on information used in a faculty ($\beta = 0.41, p < 0.001$). The information culture also mediates the impact of information empowerment on information management ($\beta = 0.297, p < 0.001$) and information use ($\beta = 0.210$, $p < 0.01$). Based on these findings, it should be pointed out, that the process of empowering academics should be one of the goals of academic librarians, especially while incorporating IL-DL skills in research engagement strategy. Through the involvement in information empowerment and culture librarians might influence the skillful control over the acquisition, organization, storage, security, retrieval, and dissemination of the information resources among academics, and through that showing that librarianship nowadays is essential to the successful use of technical infrastructure.

Academic staff self-assess their IL (4.39) higher than DL level (3.96), which could be an effect of a higher level of recognition of library digital resources (il_4 = 4.30) than digital technologies used to communicate their work. This high level of IL has a significant impact on the slightly lower results of the IE factor. Results show that IL has a positive effect on the processes of learning by experiencing contact with useful information, but on the other hand, a high IE level positively affects proactive attitudes within a risk-taking and relationship-based culture, as well as to a lesser extent in a rule-following culture. This IE-IC relationship does not affect a result-oriented culture, which was excluded from the DT model because these behaviors did not fit our model statistically. From the perspective of digital changes in social science and the humanities library service roles, such as working on digitization projects, metadata creation, which can be considered as related to managing results and research information management (Barnes, 2020) will need to be gradually enhanced by more strategic roles in academia like project planning to show more risk-taking attitudes and very characteristic for librarians' openness (Currier et al., 2017).

Discussion

This study uses the CBSEM method to explore the effect of information literacy on the individual readiness of academic staff for the challenges of digital transformation in social science and the humanities. We treated information literacy as a starting point in building this

capability to handle digital transformation in academia, which is also based on key digital competencies, self-efficacy, information empowerment, information culture, information management, and information use. The first dimension (IL) has its roots in library services, so this was treated as an exogenous variable describing the direct impact of the library services regarding information literacy among academic staff on the general state of their readiness during the digital changes in their information environment. The last dimension (IU), on the other hand, can be treated as a general outcome constituting full readiness for digital changes, as it shows the supporting roles that academics play in decisions made by the faculty and is supported by a chain of endogenous factors like IE, IC, and IM.

Our study of academic staff representing social science and humanities confirms the first three hypotheses related to the idea that improvement in IL has a significant and relatively strong impact on DL and SE during a digital change in communication habits ($\beta = 0.353$; $\beta = 0.346$) which confirms the statement that "a positive perception about their [library users] literacy skills and are proficient in using ICT, would be more likely to have high intention to use digital tools and devices in their learning" (Nikou et al., 2020). In our model, perception of one's own IL and DL skills explains about 19% of the variance in self-efficacy and even 29% of the variance in information empowerment.

Our digital transformation readiness model retained four out of eight measures of information empowerment. We rejected the variables that might indicate "awareness of the information environment", as they were statistically irrelevant, and we kept the indicators given by Ahmad et al. (2020) regarding "learning from information experience". They investigate the information literacy of CEOs who represent a relatively inaccessible segment of the workforce in an SME setting, so not all of their measures were suitable for the academic environment. It also meant that academics are biased in their awareness of their information environments, which is a problem of a lack of convergence of administrative policies and academic work at universities (Perkmann et al., 2013). In our study, we have shown that information literacy can be perceived as a driver of informed learning among academic staff ($\beta = 0.362$) i.e. learning to use the information to support didactic and research preparations at a workplace.

The approach shown by Ahmad et al. perceives information literacy as a key to "collaborative information use in an informed (socio-technical) system" – information culture. We agree but there are moderators in the middle – digital literacy, self-efficacy – that together improve the information empowerment of academic staff, and only by stipulating this increase in empowerment were we able to show the impact of these skills on information culture. In our model, information empowerment explains even 24% of the variance in information culture. We can then conclude that an employee's attitude to stay informed, look for new ways to use information, think beyond the confines of their job are grounded in high self-assessment of IL skills. Information empowerment also supports building a pro-active community of practice in a relationship-based and risk-taking information culture ($\beta = 0.566$). From the librarians' point of view, it is important to remember the crucial observation in this regard made by Somerville & Bruce (2017, p. 6) that "improving the experience of using the information to learn is about understanding the learner's perspective – that is, helping people to become better information users requires understanding their ways of experiencing effective information use." Our framework was created not only to measure the individual assessment of academic information and digital skills and empowerment but also to know how academics can leverage those skills to better orient themselves in the information culture that surrounds them.

On the one hand, in contrast to the previous study by Abrahamson and Goodman-Delahunty (2013) on information culture in the police force, we have shown that in the case of academic staff the group forms of information sharing have a significant impact on effective forms of information use in a faculty ($\beta = 0.41$). On the other hand, we confirmed the observations made by Lauri et al. (2020). They confirmed in higher education a clear dominance of the integrated information culture created from the combination of rule-following and relationship-based cultures, and the open culture resulting from the combination of relationship-based and risk-taking cultures. Similar to our study, they did not find any significant value in the result-oriented culture in Estonian higher education institutions. That means, the importance of competitive advantage, systematic activity control, and efficiency measures in external relations with stakeholders are not much beneficial in making employees ready for digital changes. Therefore, in the case of research on information culture, one should always have an individual approach to the work domain of the studied institution.

Librarians as people deeply aware of the needs of academic staff should then look for a way to support behaviors such as focusing on internal information flowing from the organization and its members, which is expressed in a relationship-based culture now mostly occurring in direct communication supported by video conferences in the time of digital changes. Such communication is often facilitated by good access to scientific sources and group critical thinking supported by digital notebooks, which also might be a clue for librarians to strengthen the integration of information searching skills and digital information management tools in IL courses, like for example the use of reference management software to support group work. Librarians are frequently prepared through different collaborative training activities to asynchronous online teaching, connecting with learners, and creating open educational resources (Carroll & Mallon, 2021). Also focusing on external information that can bring new value, like e.g. the scientific databases, should gain in importance for librarians wanting to support a risk-taking culture in academia. Our results have shown that a quick recognition of the complexities in the infringement of intellectual property rights and good conditions for sharing knowledge was considered by our respondents as critical to the ability to effectively perform academic work. Such behavior in academic information culture explains a great deal of the 45% of information use outcomes in the area of social sciences and the humanities.

According to our findings, information culture has the greatest impact on information management in a faculty ($\beta = 0.67$) and mediates the impact of information empowerment on how academics perceive effectiveness in this regard ($\beta = 0.30$). The purpose of information management in a relationship-based culture is to strengthen communication and interactions, which is why sharing information is particularly valued in our model. A good enabler, in that case, should be a support in finding and using information necessary in future group discussions. In a risk-taking culture, the purpose of information management is to support creativity and innovation, which is why sharing information and proactivity are so important in our model. Librarians might then assist in digital changes by demonstrating good practices in archiving and organizing information resources in situations when academics come across new information and try to find out how they can use it in new ways.

The third type of IC important in our model is a rule-following culture, where the purpose of IM is to strengthen internal norms and regulations. In such a culture, the main role is played by data gathered in internal sources, as well as internal policy, documentation, and highly-qualified specialists who advise on technical or legal matters. Information is used to control, improve efficiency, and provide accountability (Choo et al., 2006). It might seem that librarians have much to say in this respect, especially in the case of accountability, being in control of the publication data from institutional repositories, which is the main resource used to report academic productivity. "LIS professionals should communicate the objectives and values of institutional repositories to their organization, offer information management services to make these repositories robust and worthwhile, and evangelize the knowledge-sharing principles of submitting publications into institutional repositories." (Bhardwaj, 2014, p. 201). With the datafication of science, where the common use of bibliometric measures in national and international university rankings is visible, digital changes might be an

opportunity to strengthen the role of librarians in academia as specialists in the national and international evaluation of scientific productivity.

Conclusion

Digital transformation in academia until recently could be treated as a relatively new topic of activity, but the pandemic changed this drastically by forcing us all to embrace digital environments in our day-to-day work. This is a general opportunity for libraries, but the main challenges in transforming academia are diverse, both from a technological and organizational point of view. "Library roles to enable digital scholarship are multi-stranded, reflecting the field itself" (Cox, 2016, p. 133). Our goal was to give order to this change from a sociological point of view, in which academic libraries can facilitate a wide range of digital changes, not as a service provider, but as a partner – especially in the field of information literacy in academia. Digital transformation is a rapidly evolving field for management, administration, students, academic staff, librarians. "Along with a changing technical services landscape, academic research libraries have moved to working more collaboratively with users. Distance education programs require electronic access to the library's resources. In the humanities and social sciences, there is a growing need for access to primary source materials. Special collections departments have been and continue to be the primary repository for primary sources; historically, those with a need for primary resources had to be on campus to do their research" (Currier et al., 2017, p. 276). Based on the results we have obtained, we can confirm that stepping into this community as partners, although hard, could be easier for librarians by integrating internal and external digital resources and focusing on information search skills in information literacy courses. These competencies generally support group collaboration and empowerment of academics and can increase their efficacy of information use by opening a broader academic perspective on the digital transformation surrounding them.

Limitations

The described research does not include staff from academic libraries – a larger project is planned with an international team that will discuss this issue in detail. The first reason is that these employees cannot be viewed in terms of just one discipline. They help the entire academic community. Perhaps it is worth extending the scope of the survey regarding information literacy even more for the whole academic community. Secondly, the proposed model is so complex that a possible analysis of academic librarians would be too extensive for a volume-limited study. We have focused just on library outputs in information literacy, leaving the digital transformation of libraries to a subsequent project. However, we are sure that the clash of the attitudes of academic staff and academic librarians could become an impulse to develop new models of cooperation, necessary in the context of such changes as the digital transformation entails.

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Appendix A

The Digital Transformation Readiness Questionnaire (Likert scale 1–5).

Constructs	Items	Measures
Information management	im_1	My workplace has a formal policy for managing knowledge creation and information.
	im_2	My organization has formal procedures to share knowledge regarding best practices and current research in policing.
	im_3	My organization has a culture that promotes knowledge and information sharing.
	im_4	My work unit encourages experienced officers to communicate their knowledge to less experienced officers.
	im_5	My organization has formal mentoring programs and/or apprenticeships.
	im_6	Information about good work practices, lessons learned and knowledgeable persons is easy to access in my organization.
Information use	iu_1	My work tasks demand that we use intellectual property policies/procedures that have been successful in the past.
	iu_2	My work benefits my organization.
	iu_3	I influence what happens within my work unit.
	iu_4	My work is guided by the most current research on my filed of work.
	iu_5	I quickly recognize the complexities in an intellectual property rights infringement situation and find a way to solve the problem.
	iu_6	My work tasks demand new, creative ideas and solutions.
	iu_7	Sharing knowledge and information is critical to my ability to do my job.
Information culture	ic_1	We did not hesitate to use digital technologies to improve communication in research groups and to keep communication with co-workers at the pre-pandemic level.
	ic_2	We used digital technologies to communicate research results in teams to analyze them together and eliminate errors.
	ic_3	The team leader, manager or director controlled the open notebooks in which we wrote down our ideas for changes and new directions in research and teaching activities.
	ic_4	All information accurately describing our research and teaching activities is documented and presented on the institution's website and social media.
	ic_5	We use digital communication channels to organize department/faculty-level discussion regarding any new information about organizational changes related to teaching and research.
	ic_6	We use digital technologies when task groups search for information about companies in the business environment in order to evaluate and propose new ideas for cooperation.
	ic_7	We use digital technologies so that team members can communicate remotely and search for the information they need in notes and documents that they exchange on their own.
	ic_8	Digital technologies help us looking for external information about market research regarding student and labor market expectations.
	ic_9	We use digital communication to create group discussions about new research topics found in library electronic information sources like scientific databases.
	ic_10	We monitor changes in the scientific publications databases (internal and external) that help us explore or identify new research areas.
	ic_11	We use digital technologies to record internal meetings for future use.
	ic_12	We use digital technologies for the periodic self-assessment of research workers and group plans.
Information empowerment	ie_1	I understand our company's procedures for receiving and sharing information.
	ie_2	I know how my company enables employees to get needed information.
	ie_3	I understand my team's acceptable ways of information sharing.

(*continued on next page*)

(*continued*)

Constructs	Items	Measures
	ie_4	I am aware of the organization of information in my company
	ie_5	I can identify what sources and processes will be helpful for finding and using information in the future.
	ie_6	When I find new information, I try to find out how I can use it new ways.
	ie_7	I revise my thinking as a result of group discussions or information collected.
	ie_8	Information makes me think or act beyond the boundary of my own job.
Information literacy	il_1	I use many resources at the same time to make a research
	il_2	I can decide where and how to find the information I need
	il_3	I use different kinds of print sources (i.e. books, periodicals, encyclopedias, chronologies, etc.
	il_4	I can locate information in the library electronic information sources.
	il_5	I can select and evaluate information most appropriate to the information need.
From DL (cognitive)	il_6	I am confident with my search and evaluate skills in regards to obtaining information from the Web.
	il_7	I am familiar with issues related to web-based activities e.g. cyber safety, search issues, plagiarism
Digital literacy	dl_1	I know how to solve my own technical (ICT related) problems.
	dl_2	I can learn new digital technologies easily.
	dl_3	I keep up with important new digital technologies.
	dl_4	I know about a lot of different digital technologies.
	dl_5	I have the technical skills I need to use digital technologies for working/teaching and to create artefacts (e.g. presentations, digital stories, wikis, blogs) that demonstrate my understanding of what I have learnt.
	dl_6	I have good digital technology skills
	dl_7	Digital technology enables me to collaborate better with my peers on project work and other learning activities.
	dl_8	I frequently obtain help with my university work from my friends over the Internet e.g. through Skype, Facebook, Blogs.
	dl_9	ICT enables me to collaborate better with my peers on project work and other learning activities.
Self-efficacy	se_1	I will be able to achieve most of the goals that I have set for myself by using digital technologies.
	se_2	When facing difficult tasks, I am certain that I will accomplish them by using digital technologies.
	se_3	In general, I think that I can obtain outcomes that are important to me by using digital technologies.
	se_4	I believe I can succeed at most any endeavor to which I set my mind by using digital technologies.
	se_5	I will be able to successfully overcome many challenges by using digital technologies
	se_6	I am confident that I can perform effectively on many different tasks by using digital technologies.
	se_7	Compared to other people, I can do most tasks very well by using digital technologies.
	se_8	Even when things are tough, I can perform quite well by using digital technologies.

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